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# ABSTRACT BOOK



# A PROTOTYPE SYSTEM FOR BOILING HISTOTRIPSY IN ABDOMINAL TARGETS COMPRISING A 256-ELEMENT SPIRAL ARRAY COMBINED WITH A POWER-ENHANCED VERASONICS ENGINE

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## OBJECTIVES

Boiling histotripsy (BH) uses millisecond-long ultrasound bursts with high amplitude shocks to mechanically fractionate tissue. For pre-clinical BH studies of abdominal organs in large animals with aberration correction for body wall inhomogeneities, a high-power multi-element phased array system is needed.

## METHODS

A BH system was built comprising a custom 256-element 1.5 MHz phased array (Imasonic, Besancon, France) with a central opening to mount a P6-3 probe for real-time ultrasound imaging (a, b). The array was electronically matched (c) to the Verasonics V1 engine with a 1.2 kW external power source, and driving electronics were supplemented by an extra capacitor bank (d). System performance was characterized by hydrophone measurements in water. Volumetric lesions were generated in *ex vivo* bovine liver with 1 mm spacing, 10 ms pulse length, 5 pulses/focus, and 1 % duty cycle (e, f). Doppler sequences were used to monitor tissue liquefaction.

## RESULTS

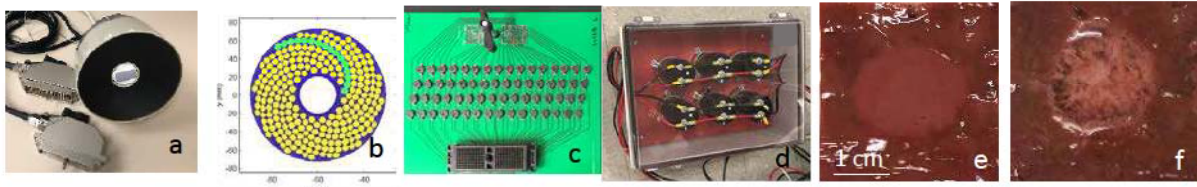
The maximum pulse average acoustic power of the system was 3.5 kW sustained for 10 ms. Fully developed shocks of 100 MPa amplitude formed at the focus at 275 W acoustic power. The -3 dB steering range was 19 mm laterally and 38 mm axially. As measured on Doppler imaging, bubble velocities within lesions increased during lesion formation.

## CONCLUSIONS

A BH prototype system was constructed and successfully implemented to produce volumetric mechanical lesions in *ex vivo* tissue using electronic steering. Lesion formation was confirmed in real time by evaluating the degree of tissue fractionation using Doppler US imaging.

## ACKNOWLEDGEMENTS

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**Figure Caption:** (a) Photo and (b) sketch of a 256-element 16-arm spiral array. (c) Custom-designed matching network and (d) extra bank of capacitors. Bisected volumetric BH lesions generated *in ex vivo* bovine liver with (e) and without (f) content.